Final Evaluation Report

Your Details	
Full Name	Upendo Msalilwa
Project Title	Assessment of the status of African baobab (*Adansonia digitata* L.) populations and their ethno-botanical importance in Tanzania
Application ID	27807-2
Grant Amount	£ 5000
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Date of this Report	16/07/2021

1. Indicate the level of achievement of the project's original objectives and include any relevant comments on factors affecting this.

Objective	Not achieved	Partially achieved	Fully achieved	Comments
To determine the status and distribution of *A. digitata* populations in different land uses in different agro-ecological zones in Tanzania			■	The objective activities have been accomplished. Two research articles have been published in peer reviewed journals.
To assess the variations of Cyclopropenoid Fatty Acids (CPFA) contents, physiochemical properties and fatty acids composition in baobab seed oil from different agro-ecological zones of Tanzania			■	The objective activities have been completed. Objectives 2 and 3 were combined and one research article titled "Physicochemical Properties, Fatty Acid Composition, and the Effect of Heating on the Reduction of Cyclopropenoid Fatty Acids on Baobab (*Adansonia digitata* L.) Crude Seed Oil" published in Journal of Lipids, 2020.
To test an efficient method for removing or reducing the concentrations of Cyclopropenoid Fatty Acids (CPFA) in baobab seed oil from different agro-ecological zones			■	The objective activities have been completed. Objectives 2 and 3 were combined to publish one research article.
To examine the use values and patterns of A. digitata by different ethnic groups in different agroecological zones of Tanzania			■	The objective activities have been completed. I am developing a manuscript on the socio-economic part.
To examine the extent of domestication and conservation strategies by different ethnic communities and predict the future management of *A. digitata* populations particularly in the face of climate change.			■	The objective activities have been completed.

2. Please explain any unforeseen difficulties that arose during the project and how these were tackled.

I expected to complete the planned project activities by June 2020, but due to COVID- 19 I completed the activities 8 months later.

3. Briefly describe the three most important outcomes of your project.

1. Substantial different in status and distribution of *A. digitata* populations in different land uses in different semi-arid zones in Tanzania. Baobab density varied substantially and significantly across land use types, with the highest baobab density (2.45 stems per ha) being observed in strictly protected areas and the lowest density (1.52 stems per ha) was recorded in non-protected areas. There was significant ($p = 0.004$) difference in baobab density between strictly protected and non-protected areas. Furthermore, there was a significant ($p = 0.003$) difference in baobab density in strictly protected and non-strictly protected areas. However, no significant ($p = 0.687$) difference in baobab density was observed in non-strictly protected and unprotected areas.

2. No substantial difference on most of the fatty acid composition and physical properties of baobab seeds crude oil. The *A. digitata* crude seed oil was found to contain mainly 12 essential fatty acids and two different CPFAs. The most abundant fatty acids were palmitic acid, oleic acid, and linoleic acid in all the baobab population hotspots occurring in Tanzania. There was no significant difference in most physico-chemical properties and fatty acid composition across the different semi-arid areas in Tanzania. The major breakdown of CPFAs occurs at 200°C, and that would be the optimal temperature recommended for the refining process of the baobab crude oil. The study recommended refining of the baobab oil at higher temperatures ranging from 200 - 250°C as the best way of reducing CPFAs.

3. Substantial different in use values and patterns of *A. digitata* by different ethnic groups in different semi- arid of Tanzania. There different in use patterns and use values in different semi-arid regions of Tanzania. Local communities in the central region (Dodoma) seem to value the baobab products especially fruits and oil as among the cash crops while in the northern (Kilimanjaro) and southern (Iringa) parts most of the communities regarded a crop of no important value to them.

4. Briefly describe the involvement of local communities and how they have benefitted from the project.

The project involved local people from the initial stage up to the end of the project. The project involved local community during the ecological surveys and laboratory sample collection. During ecological surveys, local communities were involved in identification of plots and baobab fruit collection. Local communities in Iringa, Dodoma and Kilimanjaro were involved in questionnaire survey and focus group discussions to obtain information on the use values and use patterns, different management practices and their impacts on the species.

5. Are there any plans to continue this work?

Yes, I am planning to continue this work. I am developing a research project on the phenotypic and genotypic variation of baobab fruits and its ecological contribution which are the important aspect in utilisation of baobab and conservation measures of the baobab. The project will be submitted to 1st Rufford Booster Grants for funding.

6. How do you plan to share the results of your work with others?

The results were shared in the following ways depending on the audience:

Local community: The results were communicated back to the community through meetings in Dodoma, Iringa and Kilimanjaro regions on the importance and conservation measures of the baobab.

Research community: I have developed and published four research articles which are online for the research community. I have also presented my research findings on effect of heating on baobab seeds oil fatty acid composition from semi-arid areas of Tanzania at the TAFORI Scientific Research Conference on February 2021. I have also presented my results finding on abundance and distribution of baobab in the semi-arid regions of Tanzania in Rufford conference, December 2020 in Kenya. I am preparing the one manuscript on the socio-economic aspects of baobab titled: Local peoples' perceptions on the established ethno-botanical values of different parts of baobab *(Adansonia digitata L.)* in semi-arid areas of Tanzania.

Policy makers: I am developing a policy brief on the sustainable use and conservation management of the *A. digitata* in Tanzania.

7. Timescale: Over what period was the grant used? How does this compare to the anticipated or actual length of the project?

The grant was given for 1 year. I expected to complete the project activities by June 2020, however, due to difficulties and logistical challenges encountered during field data collection and following the outbreak of COVID 19, delayed my report submission.

8. Budget: Provide a breakdown of budgeted versus actual expenditure and the reasons for any differences. All figures should be in £ sterling, indicating the local exchange rate used. It is important that you retain the management accounts and all paid invoices relating to the project for at least 2 years as these may be required for inspection at our discretion.

The estimated budget for the above two activities was £ 7,000. This research work was funded by the Centre for Research, Agricultural Advancement, Teaching Excellence and Sustainability in Food and Nutritional Security (CREATES) which has provided £ 2000 (4,680,005 TZS) and £ 5000 (15,299,081.75 TZS) was given by Rufford foundation. This budget was made on conversion of £1= 3059.82 TZS.

Item	Budgeted Amount	Actual Amount	Difference	Comments
Socio-economic data collection	2000	2000		This was the amount given by Rufford Foundation only
Laboratory analysis	3000	3000		This was the amount given by Rufford Foundation only
Totals	**5000**	**5000**		

9. Looking ahead, what do you feel are the important next steps?

I am developing another project on phenotypic, genotypic and ecological contribution of baobabs the in the semi-arid region of Tanzania. The project will be submitted to Rufford foundation for funding.

10. Did you use The Rufford Foundation logo in any materials produced in relation to this project? Did the Foundation receive any publicity during the course of your work?

Yes, I have been using the Rufford Foundation logo in the progress reports presentations, scientific conferences and while I am in the field. Also, the Rufford Foundation was acknowledged in all the materials (journal papers, brochure, poster and policy belief) that originated from this project.

11. Please provide a full list of all the members of your team and briefly what was their role in the project.

Members of the project are as follows:

Upendo Msalilwa,
I was a PhD student at the Nelson Mandela African Institute of Science and Technology (NM-AIST). I was involved in field data collection, data analyses and reports writing on the assessment of the status of African baobab (*Adansonia digitata* L.) populations and their ethno-botanical importance in Tanzania.

Dr. Linus Munishi (Main supervisor)
He is a Senior Lecturer in the School of Life Sciences and Bioengineering at the Nelson Mandela African Institute of Science and Technology (NM-AIST). He was the overall supervisor making sure all study objectives are attained. He was a GIS expert making sure the GIS part is executed properly. He was supervising the following objectives: i. To determine the status and distribution of A. *digitata* populations in different land uses in different agro-ecological zones in Tanzania; ii. To examine the use values and patterns of A. digitata by different ethnic groups in different agro-ecological zones of Tanzania; iii. To examine the extent of domestication and conservation strategies by different ethnic communities and predict the future management of A. digitata populations particularly in the face of climate change;

iv. To investigate the local peoples' perceptions on the established ethno-botanical values of different parts of A. digitata in different agro-ecological zones of Tanzania

Prof. Patrick Ndakidemi (Co-Supervisor)
He is plant and soil expert and currently employed as a Professor in the School of Life Sciences and Bioengineering at the Nelson Mandela African Institute of Science and Technology (NM-AIST). Like Dr Linus Munishi, Prof. Ndakidemi co-supervised the above four objectives.

Dr. Edna Makule (Co-Supervisor)
She is a Senior Lecturer in the School of Life Sciences and Bioengineering at The Nelson Mandela African Institute of Science and Technology (NM-AIST). She is Food and Nutrition Expert and supervising the following objectives: i. To assess the variations of Cyclopropenoid Fatty Acids (CFPA) contents, physiochemical properties and fatty acids composition in baobab seed oil from different agro-ecological zones of Tanzania; ii. To test an efficient method for removing or reducing the concentrations of Cyclopropenoid Fatty Acids (CFPA) in baobab seed oil from different agro-ecological zones in Tanzania zones.

12. Any other comments?

I am very grateful to The Rufford Foundation for the financial support that assisted me to complete my PhD studies. I am thankful to my employer, Tanzania Forestry Research Institute (TAFORI) for granting me a study leave for PhD studies. Furthermore, I am thankful to the Tanzania Wildlife Research Institute, Tanzania National Parks and Tanzania Wildlife Authority for research clearance and permit to carry out the study. Additionally, I would like to thank the park rangers for their assistance during fieldwork in the protected areas and the local communities in the semi-arid regions for their cooperation during data collection. To deliver the expected results especially for those conducting PhD studies, it is important to give them more time (1year and 6 months) to accomplish their work.